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The Prevalence of Hepatitis B Virus, Hepatitis C Virus, and Human Immunodeficiency Virus Infections Among Hemodialysis Patients in Sulaimani City, Kurdistan, Iraq

Alaa Hussain Al Krush* Mohamed Dler Hama Yousif Taha Ghafoor*** Las Omer Rafiq******

Abstract

Background and objectives: Hemodialysis patients are more susceptible to Hepatitis B Virus, Hepatitis C Virus, and Human Immunodeficiency Virus infections due to contaminated medical equipment and frequent blood transfusions. The compromised immune systems of chronic renal patients further increase their vulnerability. The study aimed to determine the prevalence of Hepatitis B, C, and Human Immunodeficiency Virus infections among hemodialysis patients.

Methods: This observational study, conducted over two months in February 2024 in Qirga and Shar hemodialysis centers in Sulaimani city, surveyed 96 patients. Data on demographics, medical history, dialysis specifics, and Hepatitis B, C, and Human Immunodeficiency Virus markers were collected through interviews and blood tests.

Results: The findings indicate that Qirga Center has a higher prevalence of Hepatitis C Virus (10%) and Hepatitis B Virus (7%) infections than Shar Hospital (4.5% and 1.5%, respectively). Moreover, 6.3% of patients in both hospitals have Hepatitis C virus infection, compared to 3.1% of patients in both facilities who have Hepatitis B virus infection. All the results were statistically significant.

Conclusion: This study emphasizes the importance of vaccination, regular viral screening, and adherence to infection control protocols in hemodialysis units.

Keywords: Hepatitis virus, Hemodialysis, Infection Control

*F.R.C. P, Assistant Professor of Medicine and Nephrology, Department of Medicine, College of Medicine, University of Sulaimani, Sulaimani, Iraq. Email alaa.awn@univsul.edu.iq
**Medical college student, University of Sulaimani, Sulaimani, Iraq. Email Mohammed.05001370@univsul.edu.iq
***Medical college student, University of Sulaimani, Sulaimani, Iraq. Email Yousef.05002189@univsul.edu.iq
****Medical college student, University of Sulaimani, Sulaimani, Iraq. Email Las.05001344@univsul.edu.iq

Introduction

Hemodialysis patients showed higher rates of hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV) infection than the general population.[1] Patients undergoing hemodialysis are more likely to get these infections because of the contaminated medical equipment they come into contact with during the procedure.[2-4] Furthermore, anemia caused by chronic kidney disease necessitates blood transfusions for a large number of hemodialysis patients. These transfusions may cause illnesses if they become contaminated. This form of transmission was more common in the past, while being minor currently, as indicated by the correlation between HCV seropositivity and the amount of transfusion blood units in hemodialysis patients.[5] Additionally, the immune systems of people with chronic renal illness are compromised, which may limit their ability to fight off HBV and HCV infections.[6] In addition, hemodialysis patients' immune responses to the HBV vaccine are not as strong as those of the non-dialysis population.[7] About the HBV vaccine, Clinical studies have demonstrated the recommended 3-dose of 10 mcg/1.0 mL administered at 0, 1, and 6 months in healthy adults ≥ 20 years of age. Dialysis formulation (40 mcg/1.0 mL) should be administered to patients undergoing dialysis or predialysis. The Advisory Committee on Immunization Practices (ACIP) defines seroprotection as having an antibody level of ≥ 10 mIU/mL against the hepatitis B surface antigen, or anti-HBs. Not every susceptible vaccinee may experience a protective response after receiving HB vaccination. It is currently unknown how long the HB vaccine will protect healthy recipients.[8] Hepatocellular carcinoma (HCC) can result from HBV and HCV infections, and patients with HCC receiving hemodialysis have a higher mortality rate than those without dialysis.[9] These infections in hemodialysis patients are associated with a higher risk of all-cause mortality and mortality from cardiovascular disease in addition to mortality from liver disease.[10] The hepatitis C virus was the sole subject of the 2009 study conducted in Sulaimani.[11] It has been demonstrated that dialysis patients who are HBsAg-positive and have active viral replication exhibit the most severe liver damage.[12] Concurrently, there is a high risk of hepatitis C virus infection in patients undergoing renal replacement therapy.[13-15] Dialysis personnel must implement and follow universal work measures to prevent the spread of these viral infections.[16] The study aimed to determine the prevalence of Hepatitis B, C, and HIV infections among patients undergoing hemodialysis. It also seeks to evaluate whether these patients have been immunized against the Hepatitis B virus and review their vaccination doses. Furthermore, the study aimed to assess the relationship between hepatitis viral infection and the history of dialysis, including factors such as the duration and frequency of dialysis.

Patients and methods

This observational study involved interviewing hemodialysis patients at the Qirga Hemodialysis Center and Shar Teaching Hospital. A standardized questionnaire was utilized to gather personal details, medical history, dialysis specifics, vaccination records, and information regarding investigations for hepatitis viral markers (HBs Ag, Anti HCV Ab, and HIV Ab). The study was conducted in Sulaimani City, in the Kurdistan region of Iraq, at the Qirga Hemodialysis Center and the dialysis department of Shar Teaching Hospital. Study participants included ninety-six patients who had received hemodialysis for at least three months. The study started on February 28, 2024, and lasted around two months, ending on April 22, 2024. Each participant gave verbal consent, and direct interviews were

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used to administer a specially created questionnaire. Interviews took place before and during hemodialysis sessions. Before each interview, the patient's medical file was reviewed to ascertain the latest viral test results (HBsAg, Anti HCV Ab, HIV Ab). Additionally, blood samples were collected before the dialysis session to detect viral markers for patients lacking recent viral marker documentation or those whose investigations were over six months old. The questionnaire gathered age, gender, place of residence, dialysis history, and weekly hemodialysis sessions. Each participant had a venipuncture to draw five milliliters of venous blood. The serum was quickly separated and sent to the lab for examination. Using the Cobas e 411 analyzer, which uses patented ElectroChemiLuminescence (ECL) technology for immunoassay analysis, the collected sera were analyzed for the presence of viral markers. Before including any participant in this observational study, verbal consent is obtained by ethical standards. The research's nature, goal, and methods were all explained in detail to the participants. Furthermore, precautions were taken to guarantee the privacy of participants' personal and health-related data during the research. The College of Medicine's Ethics Committee, University of Sulaimani, approved the document. Approval number 114 was issued on January 3rd, 2024. All individuals gave informed consent. The statistical analysis of the study was performed using SPSS version 24. The data were coded, tallied, and presented descriptively. The analysis involved inferential data techniques, including descriptive statistics such as frequency, percentage, mean, standard deviation, and the Chi-square test. The significance of the test results was assessed using probabilistic criteria based on p value. Specifically, a p-value of less than 0.001 was considered highly significant, less than 0.05 was considered significant, and greater than 0.05 was deemed non-significant.

Results

Face-to-face interviews were held among 96 patients (66 in Shar Hospital and 30 in Qirga hemodialysis center). For most of them, the investigations for viral markers were done within (1-2) months; thus, we relied on them. Out of 96 patients, only four patients missed the regular viral test check-up. To discover their current status, we took samples from the dialysis machine after the interview and sent them to the laboratory. The results came back after one day, and they all turned out negative. The results of sociodemographic data and disease markers within the studied population across the hospitals show that the prevalence of HBs Ag is 7 % (2 out of 30) in the Qirga Center. And 1.5 % (1 out of 66) in Shar Hospital and 3.1 % in both hospitals. The prevalence of anti-HCV Ab is 10 % (3 out of 30) in the Qirga Center, 4.5 % (3 out of 66) in Shar Hospital, and 6.3 % in both hospitals. All patients in our study had negative Anti -HIV Ab. All these results are shown in Table (1). According to the Hospital, the study found no statistically significant differences (or associations) between blood transfusion, HBsAg, and anti-HCV Ab since the p-value was more significant than the typical alpha 0.05, as shown in Table (2). The study's findings show no statistically significant differences (or associations) between the duration of dialysis and (HBsAg and Anti HCV Ab) according to the hospital since the p-value was more significant than the typical alpha 0.05. However, there is a statistically significant difference (or association) between the duration of dialysis in years and the duration of each session of dialysis using (Anti HCV Ab), according to Qirga Hospital, because the result of the p-value was less than the usual alpha 0.05. As shown in Table (2).

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Table (1): The Socio-demographic data of hemodialyzed patients

Hospital		Qirga		Shar		Total		p-value
Socio demographic		Fr.	%	Fr.	%	Fr.	%	
Gender	Male	15	50.0	33	50.0	48	50.0	------
	Female	15	50.0	33	50.0	48	50.0	
Age (Years)	< 30	1	3	4	6.1	5	5.2	0.355
	30 – 39	5	17	3	4.5	8	8.3	
	40 – 49	6	20	13	19.7	19	19.8	
	50 – 59	6	20	18	27.3	24	25.0	
	> 59	12	40	28	42.4	40	41.7	
Weight (kg)	< 45	1	3.3	4	6.1	5	5.2	0.892
	45 – 55	4	13.3	8	12.1	12	12.5	
	56 – 65	7	23.3	11	16.7	18	18.8	
	66 – 75	7	23.3	14	21.2	21	21.9	
	> 75	11	36.7	29	43.9	40	41.7	
HBsAg	Negative	28	93	65	98.5	93	96.9	0.179
	Positive	2	7	1	1.5	3	3.1	
Anti HCV Ab	Negative	27	90	63	95.5	90	93.8	0.306
	Positive	3	10	3	4.5	6	6.3	
Total		30	100	66	100.0	96	100.0	

Table (2): The association between the Duration of dialysis in years and the Frequency of dialysis per week with HBsAg and Anti HCV Ab according to the Hospital

Hospital			Qirga			p-value	Shar			p-value
Duration of dialysis/ year			< 2	2 – 5	> 5		< 2	2 – 5	> 5	
HBsAg	Negative	Fr.	10	14	4	0.823	26	27	12	0.502
		%	33.3%	46.7%	13.3%		39.4%	40.9%	18.2%	
	Positive	Fr.	1	1	0		0	1	0	
		%	3.3%	3.3%	0.0%		0.0%	1.5%	0.0%	
Total		Fr.	11	15	4		26	28	12	
		%	36.7%	50.0%	13.3%		39.4%	42.4%	18.2%	
Anti HCV Ab	Negative	Fr.	11	15	1	0.000	26	27	10	0.068
		%	36.7%	50.0%	3.3%		39.4%	40.9%	15.2%	
	Positive	Fr.	0	0	3		0	1	2	
		%	0.0%	0.0%	10.0%		0.0%	1.5%	3.0%	
Total		Fr.	11	15	4		26	28	12	
		%	36.7%	50.0%	13.3%		39.4%	42.4%	18.2%	
frequency/Week			1	2	3		1	2	3	
HBsAg	Negative	Fr.	0	13	15	0.922	7	42	16	0.923
		%	0.0	43.3%	50.0%		10.6%	63.6%	24.2%	
	Positive	Fr.	0	1	1		0	0	1	
		%	0.0	3.3%	3.3%		0.0%	0.0%	1.5%	
Total		Fr.	0	14	16		7	42	17	
		%	0.0	46.7%	53.3%		10.6%	63.6%	25.8%	
	Negative	Fr.	0	14	13		6	41	16	0.358
		%	0.0	46.7%	43.3%	0.088	9.1%	62.1%	24.2%	

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Anti HCV Ab	Positive	Fr.	0	0	3		1	1	1	
		%	0.0	0.0%	10.0%		1.5%	1.5%	1.5%	
Total		Fr.	0	14	16		7	42	17	
		%	0.0	46.7%	53.3%		10.6%	63.6%	25.8%	
Duration of each session of dialysis (Hours/session)			2	3	4		2	3	4	
HBsAg	Negative	Fr.	2	25	1	0.039	3	24	38	0.704
		%	6.7%	83.3%	3.3%		4.5%	36.4%	57.6%	
	Positive	Fr.	0	1	1		0	0	1	
		%	0.0%	3.3%	3.3%		0.0%	0.0%	1.5%	
Total		Fr.	2	26	2		3	24	39	
		%	6.7%	86.7%	6.7%		4.5%	36.4%	59.1%	
Anti HCV Ab	Negative	Fr.	2	24	1	0.14	3	22	38	0.525
		%	6.7%	80.0%	3.3%		4.5%	33.3%	57.6%	
	Positive	Fr.	0	2	1		0	2	1	
		%	0.0%	6.7%	3.3%		0.0%	3.0%	1.5%	
Total		Fr.	2	26	2		3	24	39	
		%	6.7%	86.7%	6.7%		4.5%	36.4%	59.1%	

The study found no statistically significant differences (or relationships) between patients who had HBV vaccination with (HBsAg) according to the hospital since the p-value was more significant than the typical alpha 0.05. Only 40% of patients at Qirga were vaccinated against HBV, while 45.5% were vaccinated at Shar Hospital. All immunized individuals, including those with only partial vaccinations (1-2 doses), were free of HBV. Only 33.3% of patients at Qirga Center were fully vaccinated (received three doses), compared to 63.3% at Shar Hospital. Only 3 patients had anti-HBs Ab after vaccination, but no patient had the titer level to assess the efficacy of vaccination. These results are shown in Table (3).

Table (3): The association between patients vaccinated for HBV and (HBsAg), according to the hospital.

Hospital			Qirga			p-value	Shar			p-value
Had vaccination for HBV			No	Yes	Total		No	Yes	Total	
HBsAg	Negative	Fr.	16	12	28	0.232	35	30	65	0.358
		%	53.3%	40.0%	93.3%		53.0%	45.5%	98.5%	
	Positive	Fr.	2	0	2		1	0	1	
		%	6.7%	0.0%	6.7%		1.5%	0.0%	1.5%	
Total		Fr.	18	12	30		36	30	66	
		%	60.0%	40.0%	100.0%		54.5%	45.5%	100.0%	
Hospital			Qirga				Shar			
Number of doses			1-2	3	Total		1-2	3	Total	
HBsAg	Negative	Fr.	8	4	12	----	11	19	30	----
		%	66.7%	33.3%	100.0%		36.7%	63.3%	100.0%	

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	Positive	Fr.	0	0	0		0	0	0	
		%	0	0.0	0.0		0	0.0	0.0	
Total		Fr.	8	4	12		11	19	30	
		%	66.7%	33.3%	100.0%		36.7%	63.3%	100.0%	
Hospital			Qirga				Shar			
Last time patient did the vaccination for HBV/month Ago			< 5	5 – 10	> 10		< 5	5 – 10	> 10	
HBsAg	Negative	Fr.	1	5	6	-----	6	8	16	----
		%	8.3%	41.7%	50.0%		20.0%	26.7%	53.3%	
	Positive	Fr.	0	0	0		0	0	0	
		%	0.0	0.0	0.0		0.0	0.0	0.0	
Total		Fr.	1	5	6		6	8	16	
		%	8.3%	41.7%	50.0%		20.0%	26.7%	53.3%	

Discussion

The study found that hemodialysis patients at the Qirga Center had a higher prevalence of HCV infection (10%) than those at Shar Hospital (4.5%). This may be related to the sterility processes of hemodialysis machines and the screening for viral markers not following the regular schedule (every 6 months). Similarly, Qirga Center had a higher frequency of HBV infection (7%) than Shar Hospital, with a prevalence of 1.5%; this difference is mainly related to the low rate of patients vaccinated against HBV in Qirga Center. In the present study in general (both hospitals), the prevalence of HCV infection is 6.3%, much lower than 26.7%, as found in the previous research conducted in Sulaimani City 14 years ago.[11] This difference may be due to improved hygiene practices, the isolation of infected patients on HD, or viral testing for blood donors who donate to HD patients. The prevalence of HBV in both centers was 3.1%. Furthermore, no validated study has been conducted in Sulaimani City on HBV infection among HD patients, so there are only so many aspects to compare. The prevalence is significantly lower if we compare this study to those conducted in neighboring areas of Iraq. For instance, the most recent study conducted in a hemodialysis unit in Basrah found that the prevalence of HBV infection was 50%, and that of HCV infection was 42.6%, as in a study by Shihab.[17] Similarly, the rate of HCV infection was 13.4%, and the rate of HBV infection was 1.1% in Baghdad's hemodialysis center, as in a study by Fahmi.[18] The study's results vary compared to those from the Middle East. For instance, HCV infection was 5.6% in Oman in a study by Al Shukri.[19] In a study by Alavian, it was 13.2% in Iran.[20] In the most recent study conducted in Damascus, Syria, by Altinawe revealed a 22.1% rate of HCV infection and 3.2% prevalence of HBV infection.[21] When comparing this study to other global studies, it can be shown in a study by Kataruka that India had a 0.7% and 16.3% prevalence of HCV and HBV infections, respectively.[22] These discrepancies could be attributed to the HBV vaccine program implemented in these institutions; however, these studies do not include the vaccination program. These differences may also be influenced by hemodialysis machine hygiene and sterility protocols. This study shows no clear link between dialysis frequency and duration and HBV or HCV infection. In contrast, multiple studies have revealed that the duration and frequency of HD therapy are important risk factors.[11] Notably, the duration of dialysis appears to be a risk factor for HCV infection at Qirga Center. This could be related to the

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sterilization processes of hemodialysis machines in these centers.

Conclusion

The study found higher rates of Hepatitis B and C infections at Qirga Center compared to Shar Hospital. It emphasizes the need for better vaccination, regular screening, and strict infection control in hemodialysis units. Improved hygiene practices are essential to reducing transmission risks. Future efforts should focus on enhancing preventive measures for patient protection.

Conflicts of Interest

None.

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